ISSN 0417-9927

DORIANA

Supplemento agli
ANNALI DEL MUSEO CIVICO DI STORIA NATURALE "G. DORIA"
GENOVA

Vol. VI - N. 274 18 - II - 1992

SMITHS
MAR 2
LIB

C. Papaconstantinou (*)

GENERAL REMARKS ON THE GREEK SEAS FISH FAUNA

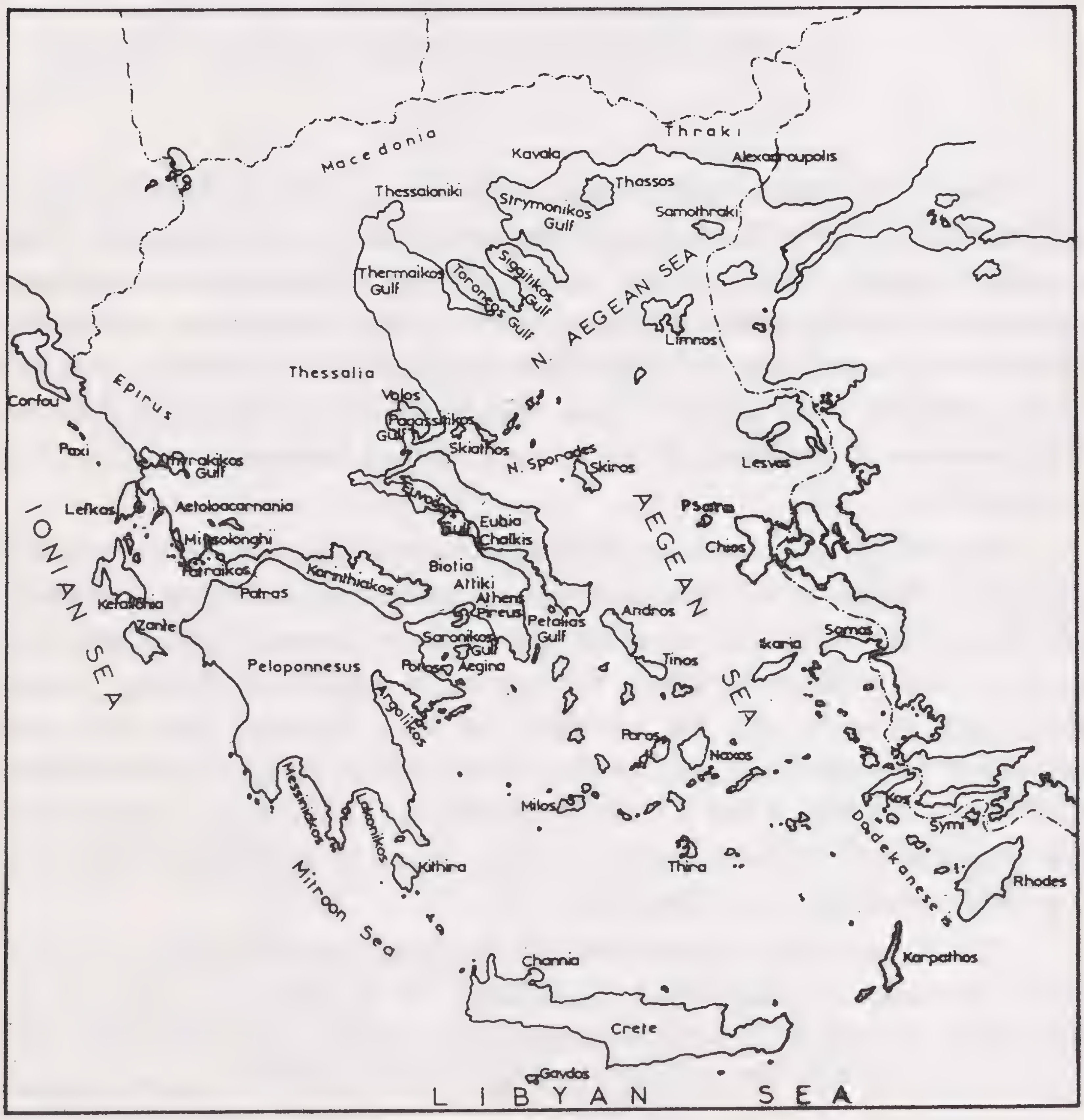
The Greek fish marine fauna is far from uniform, but the faunal differences between the different seas need further investigation. In the northern region of the Greece, boreal or pontic forms have been found occasionally (*Proterorhinus marmoratus*) or are of regular occurrence (*Sprattus sprattus*). In the southern regions of the country, the fish fauna includes some more or less widely spread, truly tropical forms. The increase in number of warm water fishes depends on increase in temperature.

Several species, such as *Chlorophthalmus agassizi*, *Micromesistius poutassou*, *Hoplostethus mediterraneus*, *Lepidotrigla cavillone*, *Lepidotrigla dieuzeidei*, *Gadiculus argenteus argenteus* etc. were formerly regarded as rare, but modern trawlers, fishing more and more deeply, proved that such species may be abudant, at least locally, and may even represent an important part of the Greek fauna. Even in recent books (Whitehead et al., 1984 - 1986: Fischer et al., 1987) no accurate data are available on the occurrence of some common species in Greek seas e.g. *Micromesistius* and *Gadiculus*.

The Aegean Sea raises difficult biogeographical problems, especially because of insufficient knowledge of its physico-chemical and dynamics structure. It is topographically divided into two basins by, approximately, the 38° parallel, into the North and the South Aegean.

(*) National Center for Marine Research. Aghios Kosmas. 16604. Greece.

The hydrological, topographical and faunistical features of the two basins differ widely. The north Aegean Sea is characterized by: (a) an extended continental shelf; (b) lower salinities in the shallow northern part, due to the Pontic fresh water going through the Dardanelles and the outflow of some big rivers (Evros, Axios, Aliakmon, Nestos); (c) absence of a thermophile fauna and (d) richness in boreal-atlantic and ponto-caspian elements, which could be included in the term «Paratethysian descendants», used by Bacescu (1985). In its deeper layers, the annual range of temperature narrows progressively. Below 250 m, the temperature remains practically unchanged throughout the year (13.5° to 14.0°C).



Map of Greece

In a zoogeographical sense, PERES (1967) and FRENJ (1972) considered as the Aegean the sea to the north of the line connecting the islands of Eubia and Psara. PAPACONSTANTINOU & TORTONESE (1980), on the basis of the spreading of some fishes, distinguished the difference in fish fauna between the north and the south of the Aegean Sea, but without accurately defining the boundary line. PAPACONSTANTINOU (1987), taking in consideration the spreading of the Lessepsian immigrants, characterizes the north Aegean Sea as an area of cold-water fauna and the south Aegean as one of warm-water.

At the end of the upper Miocene, the North Aegean Sea was the southern limit of the Sarmatic Sea, which covered nearly the whole of Hungary, large parts of the Balkan Peninsula and southern Russia, the Black and Caspian seas, while extending as far as Transcaspia to the east (EKMAN, 1953; TORTONESE, 1969). To the west, the Sarmatic Sea reached Austria and it is known that it connected with the region which today corresponds to the central Adriatic Sea. The presence of several common fishes, such as *Merlangius merlangus euxinus*, *Huso huso*, *Syngnathus tenuirostris*, *Knipowitschia caucasica*, *Platichthys flessus luscus*, *Sprattus sprattus*, confirms the faunistic relation between the Adriatic, north Aegean and the Black seas. In conclusion, it is suggested that the North Aegean Sea could be recognized as a distinct faunistic «sub-province» in the Mediterranean Sea, with different physical conditions and a good number of «endemic» fauna.

Temperature and salinity are important factors influecing the species distribution in S. Aegean, which is more thermophile, indicating a Tethysian heritage. Among the Tethys relicts are certainly the fishes *Aphanius fasciatus* and *Sparisoma cretense* (KOSSWING, 1948).

A number of the south Aegean fish species may be called subtropical or even tropical. These include the few confined to the southeastern part of the Mediterranean, for instance *Sardinella aurita*. They may have a southern origin, particolarly those belonging to genera with a mainly southern distribution, such as *Pagrus* and *Ctenolabrus*. Some of them (*Scyris, Sparisoma, Siganus*, etc) are known only there and others (*Caranx, Apogon, Thalassoma, Xyrichthys, Dactylopterus, Spaeroides*, etc.) may be found further north. Considering the distribution of the Serranids, it is possible to divide the Aegean Sea according to latitude. The Serranids are much more abundant in the southern sector; some species have been found mostly there (*Callanthias ruber*) and the tropical genus *Epinephelus* is also much more abundant.

The subtropical character is going to become more evident, because the fauna continues to receive many Lessepsian immigrants from the Red Sea, mainly sublittoral (TORTONESE, 1978). The number of Lessepsian immigrants colonizing the Aegean Sea increases continuously. Already 13 species have reached this area, following the main current along the coasts of Syria and Asia Minor: *Siganus rivulatus*, *Siganus luridus*, *Lagocephalus spadiceus*, *Stephanolepis diaspros*, *Upeneus moluccensis*, *Leiognathus klunzingeri*, *Saurida undosquamis*, *Pempheris vanicolensis*, *Hemiramphus far*, *Sargocentron rubrum* (?) *Alepes djeddaba*, *Atherinomorus lacunosus* and *Parexocoetus mento*. PAPACONSTANTINOU (1987, 1990) studied the distribution of these fishes in the Aegean Sea. Only three were found in the Cyclades (*S. luridus*, *S. rivulatus*, *S. diaspros*), one in the Saronikos Gulf (*S. diaspros*) and two off the coasts of Chios Islands (*S. luridus*, *U. moluccensis*). The remaining species were found in the Dodecanese area. However, the presence in Crete of Lessepsian immigrants is highly possible, though there are no reliable references regarding their presence there.

Among the tream of new colonizers, at least one species, namely *P. vanicolensis*, appeared almost immediately as a large population in different areas e.g. the coast of Lebanon (MOUNEIMNE, 1979), Israel (BEN TUVIA, 1985; GOLANI & BEN TUVIA, 1986) and the Dodecanese Islands (PAPACONSTANTINOU & CARAGITSOU, 1987b). Thus, it is evident that the colonization of Greek seas by the Lessepsian immigrants is a continuous process.

The abundance of Red Sea immigrants in the S.E. Aegean (Dodecanese Islands), in both species and biomass, may imply that the immigration has an immense impact on the ecological balance of the region. However, although the colonizers could compete with some of the native species there is no evidence of a drastic change in abundance of any of the Greek commercial fish that could be attributed to a new competitor. The appearance of *U. moluccensis* does not seem yet detrimental to the native *Mullus barbatus* and *Mullus surmulettus*. On the other hand, along the Lybian coasts, *S. rivulatus* does seem to reduce the abundance of *Boops boops*, since both species feed upon algae (TORTONESE, 1969).

The Ionian Sea is characterized by a narrow continental shelf and high depth, with salinity and temperature levels between those of the west and east Mediterranean. The fish fauna of the Greek Ionian Sea is predominantly Atlantic-Mediterranean. For a complete faunistic study of the area, it is necessary to examine the wider area of the Ionian Sea and to evaluate the data on the Italian (BRUNELLI & BINI, 1934; PARENZAN, 1960; GALLOTI, 1973) and Albanian coasts. Information regarding the ichthyofauna of the Greek Ionian Sea is very limited and mostly refer to the central Ionian (KASPIRIS, 1973; TORTONESE, 1975; PAPACONSTANTINOU, 1985, 1986; PAPACONSTANTINOU et al., 1987). Of interest are TAANING'S (1918, 1923) and EGE'S (1930, 1934, 1953) informations on the bathypelagic fish fauna.

The less warm and saline Ionian Sea is inhospitable to a great number of E. Mediterranean species of tropical or subtropical character and constitute an additional barrier to tropical species. On the other hand, the Ionian Sea makes difficult the passage to the east of some Lusitanian and Mauritanian species that dominated the fish fauna of the W. Mediterranean.

References to Lessepsian immigrants in the Ionian are scarce. KASPIRIS (1973, 1976) mentions the presence of *S. luridus* in the Patraikos Gulf, TORTONESE (1969) in the Gulf of Taranto, and KTARI - CHAKROUN & BOUHLAL (1971) off the Libyan coasts. The fish fauna of the Ionian Sea do not include any of the Sarmatic relicts, despite the connection of the Ionian and the Adriatic seas; this makes difficult the separation of the area into faunistic subareas.

From the literature on sublittoral species, it is evident that the fish fauna of the area tend to prefer warmth, as manifested by the presence of *Synodus saurus*, *Callanthias ruber*, *Macrorhamphosus scolopax*, *Pomadasys bennetti*. These species are not found in the neighbouring sea areas, such as the Patraikos or Korinthiakos gulfs, connected to the Ionian Sea.

There is an obvious difficulty in the exchange of deep-water fish between the Korinthiakos Gulf and the Ionian Sea. This is due (PAPACONSTANTINOU, 1985) not only to the shallow depth of the Patraikos Gulf, which acts as a barrier but also to the currents between the two areas, which do not occur when the larvae of these species go through their pelagic phase.

For a good number of species, a definite answer about their distribution cannot be given at present and the knowledge of their distribution in Greek seas is still incomplete. In the last few years, several fishes were found in new localities, often far from those where they came from. The data concerning the distribution of some species, e.g. Lessepsian, Sarmatic relicts, along the Greek shores are scattered.

A total of 447 identified fishes, representing 129 families, are listed recently by Papaconstantinou (1988). This number is substantially lower than that of 579 quoted by Tortonese (1987) in the Mediterranean Sea. Most of these species are sublittoral or bathypelagic: abyssals species are not known in Greek seas, because to the difficulty to collect them. This fish fauna is limited to the Mediterranean Sea, which seems to lack representative families characteristic of neibgbouring waters, such as the Atlantic.

The ichthyofauna of Greek seas is predominantly of Atlanto-Mediterranean character. Out of a total of 447 marine fishes identifies in territorial Greek waters, 283 species (63.3%) belong to this category. There are 21 (4,7%) cosmopolitan species, 44 (9.8%) of worldwide distribution known in the Atlantic and Indo-Pacific, and 86 (19.2%) endemic in the Mediterranean Sea (77) and in the Mediterranea and Atlantic (9). At least 13 Lessepsian immigrants species (2.9%) constitute part of the Greek fish fauna.

REFERENCES

Bacescu M., 1985 - The effects of the Geological and Physico-chemical Factors on the distribution of Marine plants and animals in the Mediterranean, 195-212, *In*: Mediterranean marine ecosystems. Maria Moraitou-Apostolopoulou and Vassili Kiortsis (eds). Plenum press, New York and London.

Ben-Vita A., 1985 - The impact of the Lessepsian (Suez canal) fish migration on the eastern Mediterranean ecosystem, 367-375. *In*: Mediterranean marine ecosystems. Maria Moraitou-Apostolopoulou and Vassili Kiortsis (eds). Plenum press, New York and London.

Brunelli N.A., and G. Bini, 1934 - Ricerche comparative sulle pesche profonde di diversi mari italiani. *Boll. Pesca. Piscicult. Idrobiol.*, **10** (6): 733-744.

Ege V., 1930 - Sudidae (*Paralepis*). Rep. Danish Oceanogr. exp. 1908-1910, **2** (10), A13, 193 p.

Ege V., 1934 - The genus *Stomias* Cuv., taxonomy and biogeography. *Dana Rep.*, **5**, 58 p.

Ege V., 1953 - Paralepididae I. (*Paralepis* and *Lestidium*). Taxonomy, ontogeny, phylogeny and distribution. *Dana Rep.,* **40** 184 p.

Ekman S., 1953 - Zoogeography of the Sea. Ed. Sidwick and Jackson Ltd., London.

Fischer W., M. Schneider et M.L. Bauchot, (redacteurs), 1987 - Fishes FAO d'identification des éspèces pour les besoins de la Pêche. Mediterranée et Mer Noire. Zone de pêche 37. (Revision I). Vol. II. Vertebres. Rome FAO et CEE: 761-1530.

Fredj G., 1972 - Stockage et exploitation des données en ecologie marine. A. Un fichier sur ordinateur des invertebres macrobenthiques. *Mem. Inst. Ocean.,* **4**, 61 p.

Gallotti A.M., 1973 - Pesci del golfo di Taranto, *Ann. Mus. civ. St. nat. Genova*, **79**: 177-125.

GOLANI D., and A. BEN-TUVIA, 1986 - New records of fishes from the Mediterranean coast of Israel including Red Sea immigrants. *Cybium*, **10**, (3): 285-291.

KASPIRIS P., 1973 - Contribution to the study of osteichthyes of the Corinthiakos and Patraikos Gulf and the Ionian Sea. Phd. Thesis. Univ. Patras. 122 p.

KASPIRIS P., 1976 - New fish record from the Greek part of the Ionian Sea. Rev. Trav. Inst. Pêches marit., 40 (3 et 4): 627-628.

KOSSWIG C., 1948 - Über Tethysrelikte in der türkischen fauna. *C.R. Soc. Turq. Sci. Phys. Natur.*, **10**, 31 p.

KTARI-CHAKROUN F., et M. BOUHLAL, 1971 - Capture de *Siganus luridus* (Ruppel) dans le golfe de Tunis. *Bull. Inst. Oceanogr. Pêch.*, Salambo, **2** (1): 49-52.

MOUNEIMNE N., 1979 - Poissons nouveaux pour les côtes Libanaises. *Cybium* 3 ser., **6**: 105-110.

PAPACONSTANTINOU C. and E. TORTONESE, 1980 - On a collection of fishes from the Thermaikos Gulf (N.E. Greece). *Thalassographica*, **3** (2): 15-42.

PAPACONSTANTINOU C., 1985 - Some aspects of the Korinthiakos and Ionian ichthyfauna. Prakt. 7th Congr. Hel. Biol. Society: 69-70.

PAPACONSTANTINOU C., 1986 - The ichthyofauna of Korinthiakos and Patraikos Gulfs and the Ionian Sea. *Biologia Gallo-Hellenica*, **12**: 229-236.

PAPACONSTANTINOU C., 1987 - The Lessepsian migrants in the Aegean Sea. *Biologia Gallo-Hellenica,* **13**: 15-20.

PAPACONSTANTINOU C. and E. CARAGITSOU, 1987 - The first occurrence of the lessepsian fish immigrant *Pempheris vanicolensis* in territorial Greek waters. *Thalassographica,* **9** (2): 78-79.

PAPACONSTANTINOU C., E. CARAGITSOU, K. STERGIOU, V. VASSILOPOULOU, G. PETRAKIS, C. MITILINEOU and T. PANOS, 1987 - Dynamics of demersal fish population in the Korinthiakos, Patraikos Gulfs and Ionian Sea. Part I. N.M.C.R., Special Publication N. 13, 208 p.

PAPACONSTANTINOU C., 1988 - Check-list of marine fishes of Greece, N.C.M.R. & H.Z.S. (ed), 257 p.

PAPACONSTANTINOU C., 1990 - The spreading of Lessepsian fish migrants into the Aegean Sea (Greece). *Sci. Mar.,* **54** (4): 313-316.

PARENZAN P., 1960 - Pesci abissali e preabissali del golfo di Taranto. *Thalassia Jonika*, **3**: 3-68.

PERES, J.M., 1967 - The Mediterranean Benthos. *Oceanogr. Mar. Rev.*, **5**, 449 p.

TAANING A.V., 1918 - Mediterranean Scopelidae (*Saurus, Aulopus, Chlorophthalmus* and *Myctophum*). Rep. Danish Oceanogr. exp. 1908-1910, 2 (5), A7, 154 p.

TAANING A.V., 1923 - *Lophius*. Rep. Danish Oceanogr. exp. 1908-1910, 2 (7), A10, 30 p.

TORTONESE E., 1969 - La fauna del Mediterraneo e i suoi rapporti con quelle dei mari vicini. *Pubbl. Staz. Zool. Napoli*, **37**, 2° suppl.: 369-384.

TORTONESE E., 1975 - Osteichthyes (parte seconda). Fauna d'Italia XI vol., Ed. Calderini, Bologna, 636 pp.

TORTONESE E., 1978 - How is to be interpreted a «Mediterranean» species. *Thalassographica,* **2** (1): 9-17.

TORTONESE E., 1987 - Pesci del Mediterraneo. Recenti studi intorno alla sistematica e distribuzione. Quad. Ist. Idrobiol. Acqu. «G. Brunelli», Numero speciale, 111 p.

WHITEHEAD P.J.P., BAUCHOT M.L., HUREAU J.C., NIELSEN J., and TORTONESE E., (edes) 1984-1986 - Fishes of the North-Eastern Atlantic and the Mediterranean. UNESCO, vol. I, II, III, 1473 p.

RIASSUNTO

Fino ad oggi nei mari della Grecia sono state rinvenute 450 specie di pesci, un numero significativamente ridotto rispetto alle 579 presenti nel Mediterraneo. L'ittiofauna greca non è omogenea ma risulta composta principalmente da specie Atlanto-Mediterranee mentre poche sono le specie cosmopolite o endemiche del Mediterraneo. Almeno 13 immigranti lessepsiani fanno parte della ittiofauna greca. Nella regione settentrionale del mare Egeo sono state trovate specie boreali o pontiche a distribuzione limitata (*Proterorhinus marmoratus*) mentre nella parte meridionale dello stesso bacino molte sono le entità pseudotropicali (*Scyris, Caranx, Sparisoma*). Fino ad oggi per un buon numero di specie, soprattutto batipelagiche, non si può definire una distribuzione nei mari della Grecia essendo le attuali conoscenze ancora incomplete.

ABSTRACT

A total of 450 fish species was found in the Greek seas, a number which is significantly lower than that of 579 quoted in the whole Mediterranean Sea. The Greek fish marine fauna is far from uniform. It predominantly consists of Atlanto-Mediterranean species, while a small number belongs to cosmopolitan and endemic to Mediterranean Sea species. At least 13 lessepsian immigrant species constitute part of it. In the northern region boreal or pontic forms have been found either locally (*Proterorhinus marmoratus*) or are considered of regular occurrence (*Sprattus sprattus*), wilst in the southern some truly tropical forms (*Scyris, Caranx, Sparisoma*) are included. At present, for a good number of species, mainly bathypelagic, a definite answer about their distribution in the greek seas cannot be offered since any knowledge is still incomplete.

Tipi e Stampa: Erredi Grafiche Editoriali - Via Trensasco, 11 - Genova